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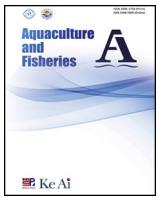

Review article

The economic contribution of fish and fish trade in Bangladesh

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ABSTRACT

Bangladesh possesses a large wetland area comprising diversified fisheries resources. Fish and fisheries are an integral part of Bangladesh and have earned its importance due to immense export and revenue potential. The objective of this study was to investigate the trend of fish production, export and import of Bangladesh during the last two decades. Several reviews of the literature were done, numerical data was obtained from the Ministry of Fisheries and Livestock (MoFL), Department of Fisheries (DOF), Bangladesh Bureau of Statistics (BBS). The results showed that fish production has increased in Bangladesh during the last two decades, starting from 17.81 lakh metric tons in 2000–01 and reaching up to 41.34 lakh metric tons in 2016–17. Due to the gradual decline in capture fishery, a significant percentage of total production comes from aquaculture. Hilsha (*Tenualosa ilisha*) is the largest single-species fishery in Bangladesh which makes the highest contribution to the country's total fish production. Exports of the fish commodity in terms of quantity and value has declined in recent years due to food quality and safety standards. This study has highlighted the contribution of fisheries production in Bangladesh and trade to the country's economy. By paying more attention to the fisheries sector, Bangladesh can boost up its economy.

1. Introduction

The fisheries sector is one of the most productive and dynamic industries which have a tremendous potentiality for future development in the agrarian economy of Bangladesh. Bangladesh is endowed with vast diversified fisheries resources which are broadly categorized into inland fisheries and marine fisheries. Inland fisheries are covering an area of 47.60 lakh ha, which has two sub-sectors, i.e. inland capture and inland culture (FRSS, 2017). Inland capture includes beel, river, estuary, Kaptai lake, flood plain occupies an area 39.27 lakh ha where inland culture comprises a pond, ditch, baor, pen culture, cage culture, shrimp/prawn farm, seasonal cultured water body covering an area of 8.33 lakh ha. On the contrary, marine capture fisheries cover an area about 1, 18,813 km^2 along with 200 nautical miles of EEZ from the baseline (DoF, 2017).

Fish is the primary protein source in Bangladeshi diet contributing about 60% of total animal protein while per capita fish consumption in the country reaches 62.58 gm, which is higher than their daily protein demand (60 gm) as per the report of the (BBS, 2017). As an agro-based country, the contribution of fisheries to the national economy has always been essential and as the primary source of animal protein, employment opportunities, food security, foreign earnings and socio-economic development (FRSS, 2017). It contributes 3.61% to Bangladesh national GDP and around 24.41% to the agricultural GDP (DoF, 2017). Last ten years of average growth performance of this sector is almost 5.43%. Bangladesh has ranked 3rd in the world in inland fish production, 5th in aquaculture production and 11th in marine fish production in 2018 (FAO, 2018). Bangladesh is now self-sufficient in fish production and has started to get global recognition as one of the biggest fish producers among the countries (FRSS, 2017).

Gracefully Bangladesh has won the maritime boundary by the International Tribunal for the Law of the Seas (ITLOS) that provides an equitable manner and rights in fishing and has opened a new horizon of finding new fishing grounds for demersal and pelagic fishes in the area. About 2, 70,000 fishing households directly and indirectly dependent on the marine fishery for their livelihoods. Recently the Bangladesh government has emphasized on enhancing blue growth and achieving sustainable development goals (SDGs), where marine resources will play a key role (Islam and Shamsuddoha, 2018). This study will be helpful and can play a significant role for the government in achieving

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Table 1
Fish production of Bangladesh from different aquatic resources in 2016–17 (FRSS, 2017).

Types of fisheries	Sector of Fisheries	Water Area (Hectare)	Production (Metric Ton)	% of Production
Inland Open Water (Capture)	River and Estuary	853863	271639	6.57
	Sundarbans	177700	18086	0.44
	Beel	114161	98117	2.37
	Kaptai Lake	68800	9982	0.24
	Floodplain	2712618	765782	18.52
Capture Total		3927142	1163606	28.14
Inland Closed Water (Culture)	Pond	384700	1833118	44.34
	Seasonal cultured water body	136273	215547	5.21
	Baor	5488	8002	0.19
	Shrimp/Prawn Farm	272717	246406	5.96
	Crab*	27010	14421	0.35
	Pen Culture	7564	13368	0.32
	Cage Culture**	1.10 lakh cu. Meter	2490	0.06
Culture Total		833752	2333352	56.44
Inland Fisheries Total		4760894	3496958	84.58
Marine Fisheries				
	Industrial (Trawl)		108479	2.62
	Artisanal		528997	12.79
Marine Fisheries Total			637476	15.42
Country total			4134434	100

the SDGs target.

Fisheries sector can also contribute to the pro-poor goals directly by providing employment (as fishers and other related trade) and a source of livelihood. The entire fisheries sector supports the livelihoods of people more than 18 million in the country directly and indirectly (FRSS, 2017). About 1.4 million women depend on the fisheries sector for their livelihoods through fishing, farming, fish handling & processing (BFTI, 2016). This sector also has a high potential for the perspective of the economic development of the country. There is a close connection between agriculture growth and economic development (Mohsin et al., 2015). Countries neglecting expansion in agriculture cannot boost their economy when the agricultural sector starts to improve, automatically the export of the country's increases. Thus, revenue begins to rise and strengthen the country's economic development.

Fisheries and aquaculture are the second-largest export industry and the most critical contributors in export earning in Bangladesh (Shamsuzzaman et al., 2016). Bangladesh produces and exports diversified fish. Fishery products in around 60 countries of the world (Ferdous & Hossain, 2015) and the major export country of Bangladeshi fish and fishery products are the European Union (EU), USA, and Japan (Rahman, 2008).

As most of the inland capture fisheries have been under heavy pressure, considered fully exploited or overexploited in that case aquaculture will be central to meeting the fish demand with the increasing population (Finegold, 2009). For sustainable production of fisheries resources require an economic assessment of the role of the fisheries sector to ensure optimum exploitation of resources, equitable distribution, efficient marketing of fish and fish products and evolution of alternative management strategies. As inland open water fisheries resources are getting depleted, the pressure to extract higher value from them is also increasing. In that case, economic analysis can play a significant role in making more evidence-based decisions and in identifying the most efficient options for intervention in the fisheries sector.

There have been several reviews of the fisheries sector and aquaculture challenges (Ghose, 2014; Hossain, 2014), but no studies have been carried on the contribution of fish production and economic importance. This is the pivotal study which links fisheries production to its economic importance. The main objectives of this study are to show the economic trend regarding the contribution of the fisheries sector to the country's economy and to draw a meaningful conclusion.

2. Materials and methods

This study was conducted using information from different secondary sources. All the data were collected from scientific research and grey literature published in various forms (e.g. peer-reviewed journals, periodicals and government gazettes). The information was collected through the available online database by using the following keywords ‘Fisheries resources’, ‘Inland and Marine fisheries’, ‘Legal issues’, ‘Export and Import’, ‘SDGs’. Further information was also collected through visiting different relevant institute, e.g. Bangladesh Fisheries Development Corporation, Directorate of Fisheries of the Bangladesh Government, Ministry of Fisheries and Livestock (MoFL) and Department of Fisheries (DOF), Bangladesh Bureau of Statistics (BBS). For analyzing the data, MS Excel has been used. All these gathered data were reviewed, synthesized, and relevant information was used.

3. Results

By considering the agro-ecological context of the country, there is a broad scope of flourishing the fisheries resource potentials both at vertical and horizontal dimensions. Bangladesh fisheries have an ample range of development to strengthen the national economy and in ensuring food security.

3.1. Annual fish production trend

Bangladesh is one of the world's leading fish producing countries where inland aquaculture contributes 56.44%, and inland capture contributes 28.14%, to total production in 2016–17 (Table 1). The marine fisheries production contribution to total fish production in 2016–17 was 15.42% with a growth rate of 1.75% (Table 1). Bangladesh has achieved self-sufficiency in fish production where per capita consumption of fish was 7 kg/year in 1990, and that stands at 30 kg/year in recent years (FRSS, 2017). In 2016–17, the output of capture fishery was 11.63 lakh MT, and the culture total was 23.33 lakh MT. As a result of recently achieved an enormous amount of maritime boundary, marine fisheries production has increased. Total marine fisheries production in 2016–17 was 6.37 lakh MT, whereas industrial trawl fishing is 1.08 lakh MT and artisanal fisheries are 5.29 lakh MT (Table 1).

Total fish production in Bangladesh has increased sixfold in the last 34 years, and fish production is now expected to reach 45.52 lakh tons

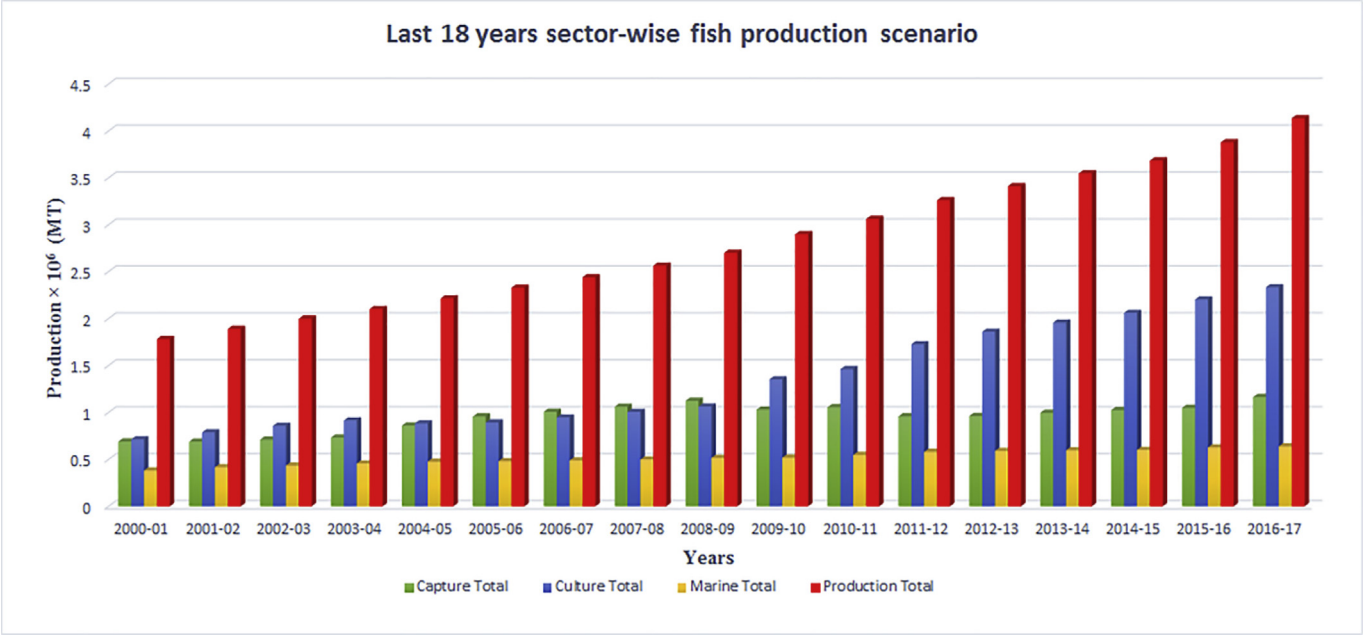

Fig. 1. Annual fish production in Bangladesh over the last 18 years (2000–01 to 2016–17) (DoF, 2017).

by 2020–21 (FRSS, 2017). This study found that there remained an increased general trend of overall fish production during the last 18 years in Bangladesh. In 2000–01 there was a production of 17.81 lakh metric tons while it reached up to 41.34 lakh metric ton in 2016–17. There was a general trend of increasing fish production from 2010 to 11 to 2015–16 with a production value of 30.61 lakh MT in the previous year and 38.18 lakh MT in the last year. In 2016–17, the demand for fish production was 40.50 lakh MT, but the annual output was 41.34 lakh MT which is a significant achievement for the country (Fig. 1).

The overall production trend of species wise capture fishery showed a gradual increase from 2000 to 01 to 2012–13. But in the next years suddenly the production dropped due to a decline in capture habitat area. It has been found that profoundly changed occurred in case of Catfish group, while the lowest change in Major Carp and other Minor Carp fish group. At present, significant carp's species such as *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala* and *Labeo calbasu* along with exotic carp, such as silver carp (*Hypophthalmichthys molitrix*); grass carp (*Ctenopharyngodon idella*); and common carp (*Cyprinuscarpio*) are the most widely practised culture system and available in the market. Now a day's new interest is growing in live fishes like koi (*Anabas testudineus*), singh (*Heteropneustes fossilis*), magur (*Clarias batrachus)*, pabda (*Ompok pabda*), gulsha (*Mystus cavasius*), etc. Live fish production was tripled 1.27 lakh MT in 2016–17 from the base year of 2000–01 (45638 MT) (Fig. 2). Both live fish and indigenous carp fishes have high market demand and getting consumer preference.

Total aquaculture production has been increased up to 23.33 lakh MT in comparison to the base year 2000–01 with the production value 7.87 lakh MT (Fig. 3). After fluctuations in the production within the period of 2004–05 & 2005–06, the domestic aquaculture production including the pond, ditches, shrimp, baor etc. showed an increasing trend from 2006 to 07 to 2016–17. Aquaculture has been progressing with reasonable success due to the expansion of various developed technologies. Now a day's pen and cage culture are getting popular and are the most widely practised culture system in Bangladesh. Coastal aquaculture, both shrimp and prawn and finfish farming are expanding, and total shrimp and prawn production have been increased over the last 18 years (Fig. 3).

3.2. Production trends of Hilsa (Tenualosa ilisha)

Hilsa, the country national fish has been declared as a Geographical Indicator (GI) for Bangladesh (DoF, 2017). About 12% of the country's total fish production comes from hilsa, and as a single species, it makes the highest contribution to the country's total fish production (Toufique, 2015). About 65% of Bangladesh's total catch of Hilsa currently originates from the marine environment. Hilsa production has increased over the last thirty years in Bangladesh (Fig. 4). In 1999–00 the total production of Hilsha was 2.19 lakh metric tons, and in the next years 2001–02 the production increased and reached up to 2.20 lakh metric ton. Afterwards, a significant fall in the production occurred in 2002–03 (1.99 lakh MT). After declining, the output again started to boom, and there remains an increased general trend during the period 2003–04 to 2016–17. Total hilsa catch risen from 2.55 lakh MT in 2003–04 to 3.94 lakh MT in 2015–16. In 2016–17, hilsa production reached at its peak with a production quantity of 4.96 lakh metric tons. The growth rate of hilsa production is 25.69%. It is reported that about 0.5 million traditional hilsha fishers' livelihoods (38% of the total capture fisheries employment) directly depend on the hilsha catch (DoF, 2017). More than 4.5 lakh fishers directly depend on hilsha through transporting, marketing, net and boat making, and exporting (Roy & Habib, 2013, pp. 101–104).

3.3. Marine fisheries

The coastal and marine zone of Bangladesh is one of the world's wealthiest ecosystems having higher productivity and unique mangrove influences. The marine fisheries resources keep a crucial role in the economy of the country, contributing about 16% of the total fisheries production. The entire fish group in marine fisheries has shown a significant change in production where Sea catfish, Jewfish, Indian salmon, shark, and other marine fish showed a gradual decrease over the last 19 years. The highest output from marine fish catch was Bombay duck (*Harpodon neherius*) in comparison to other Pomfret (*Pampus argenteus)*, Indian Salmon (*Eleutheronematetra dactylum*), Jewfish, catfish, etc. (Fig. 5).

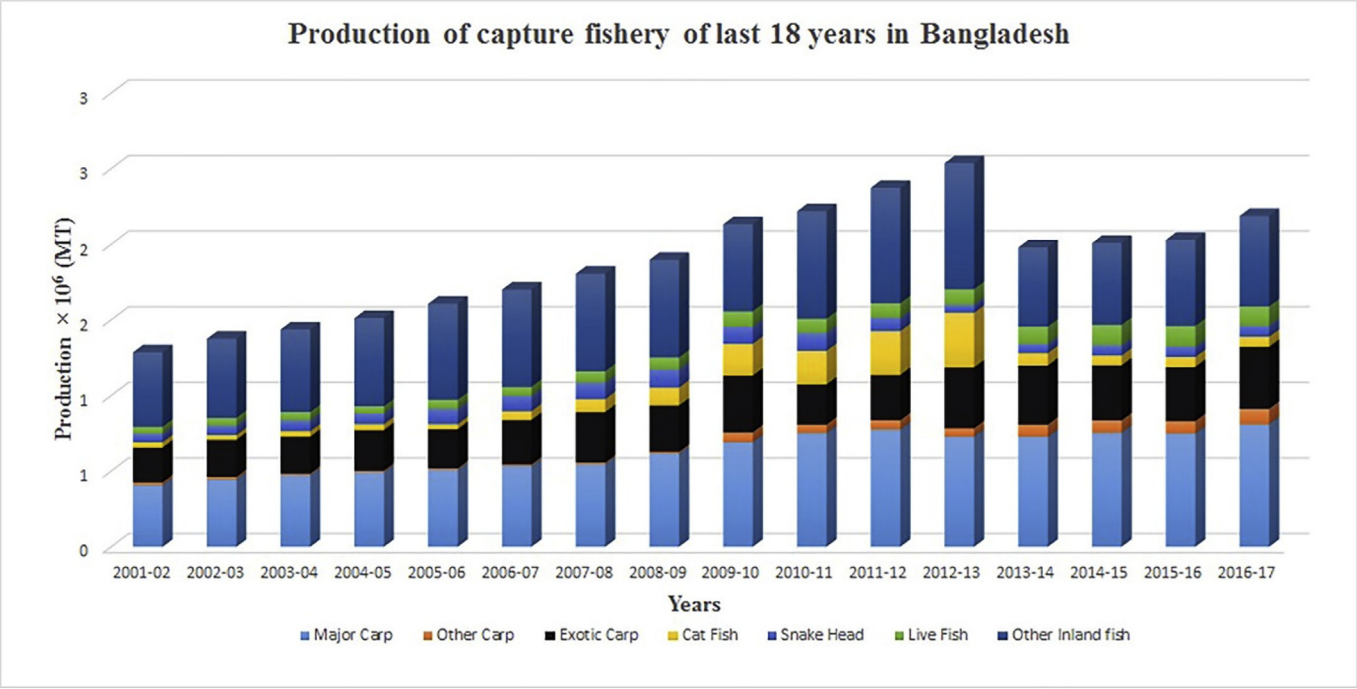

Fig. 2. Species wise capture fishery production of the last 18 years in Bangladesh (FRSS, 2017).

3.4. Export of fish and fishery products

Bangladesh earns a considerable amount of foreign currencies by exporting fish, shrimps and other fisheries products (Islam & Haque, 2018). Export volume is substantially increased and onwards. The trend of export was not remained straight to upward from the fiscal year 2000–2001 to 2016–2017. Notwithstanding the fact, there was ups and down from the beginning to date. There existed a decreasing trend in export as well as in national earning. Also, there was an increasing trend in the export of fish and fish products from the period of 2000–01 to 2010–11. But the coming years up to 2017, the export quantity and earnings did not show any significant trend except crab & kuchia (Eel fish) (Table 2).

Data analysis showed that period from 2000 to 01 to 2009–10 proved to be very good for exporting frozen fish, dry fish, salted fish, frozen shrimp/prawn and brought a lot of revenue. Beginning from 2000 to 01 to 2010–11 almost gradual increase in export of frozen shrimp/prawn was observed shifting from 29713 MT (1885.2 crore taka) to 54891 MT (3568.2 crore taka) correspondingly. Export again dropped in the next year. Coming years showed fluctuated export quantity (Table 2). There were ups and downs in the shipping of live fish from the beginning to date. It has been found that there is an

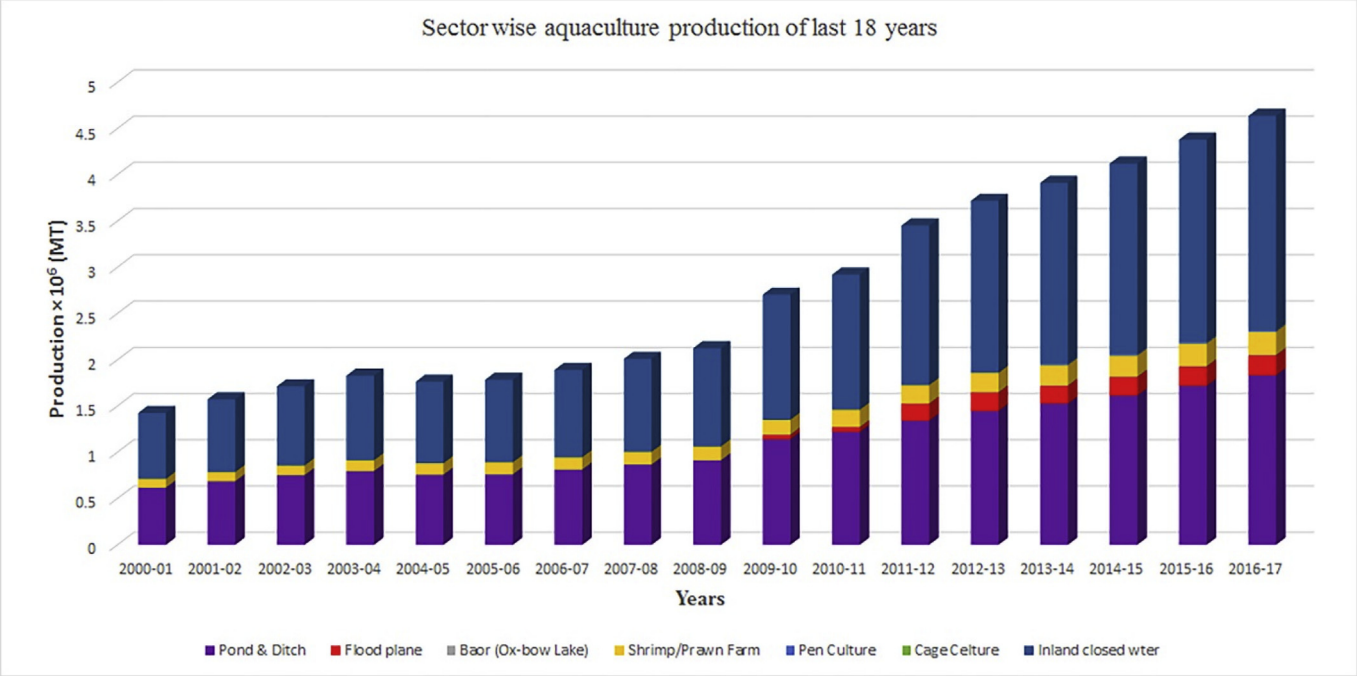

Fig. 3. Total aquaculture production in Bangladesh from 2001 to 02 to 2016–17 (Units: metric tons) (DoF, 2017).

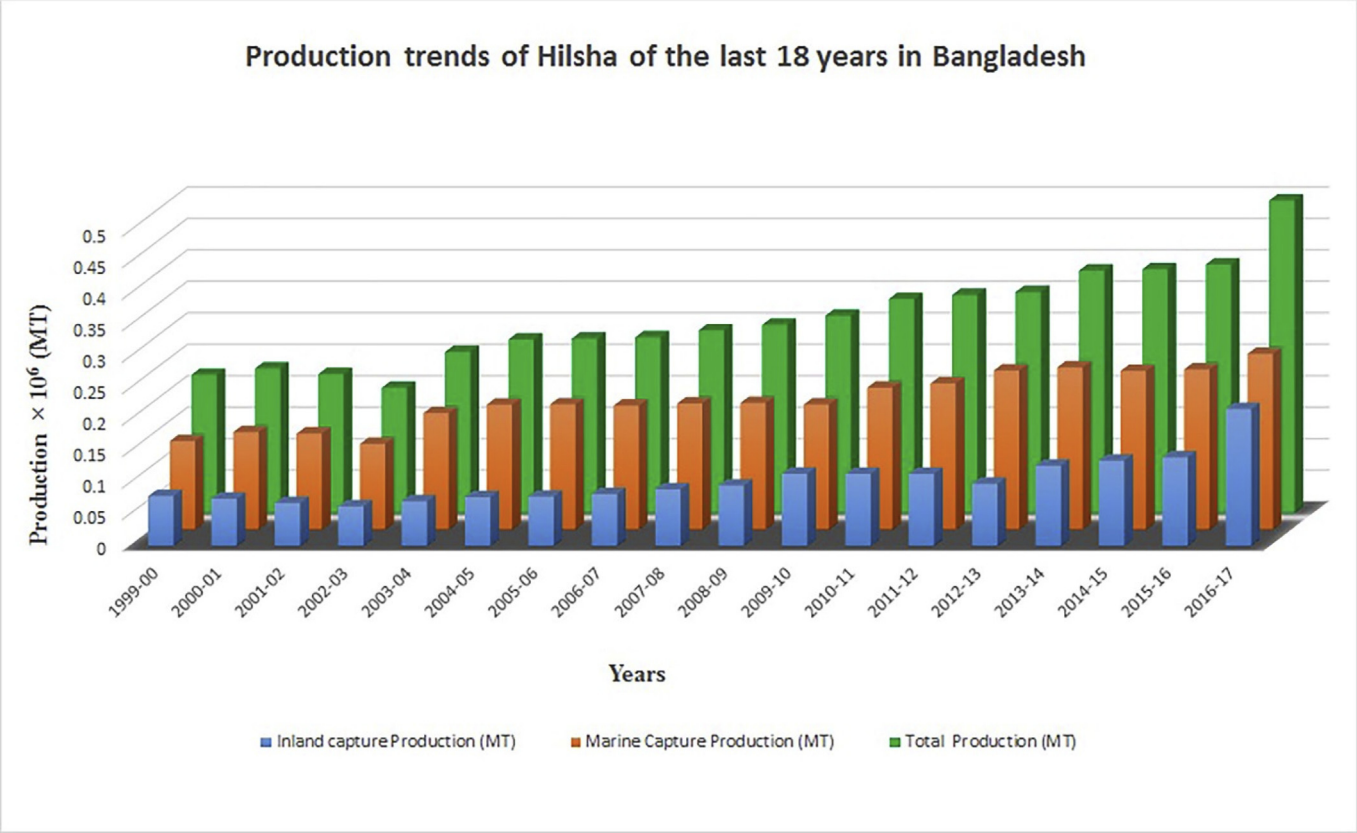

Fig. 4. Total Hilsha (*Tenualosa ilisha*) production in Bangladesh from 1987 to 2017 (FRSS, 2017).

increasing trend in the trading of dry fish from 2000 to 01 to 2014–15. During the following years, in 2015–16, the export of this commodity dropped to 2229 MT (30.12 crore taka).

Fisheries and aquaculture sector have been earning a notable amount of foreign exchange during the last six years. In 2011–12 with an exported quantity 92479.18 MT, this commodity contributed 598 million USD to the national economy. But in the next year export quantity and earnings of the country's decreased, reached at 84904.5 metric tons (534.92 million USD). However, in the next year 2013–14, there existed an increasing trend in export as well as in national earnings up to 630.29 million USD and almost TK 4892.22 crore by exporting 77328.86 MT. In 2014–15, the country earned virtually Tk. 4660.60 core by exporting 84.0 thousand MT of fish and fisheries products. During the next two years (2015–16 and 2016–17) export

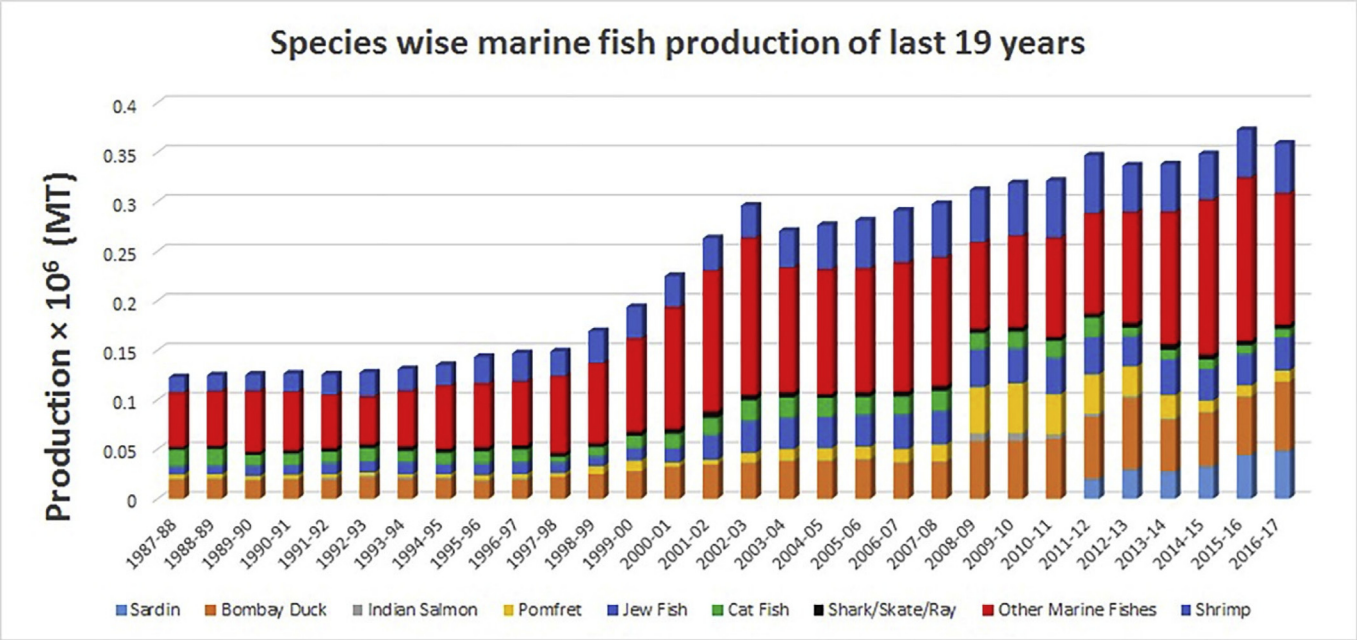

Fig. 5. Annual marine fish production of Bangladesh over the last 19 years (1987–88 to 2016–17) (FRSS, 2017).

Table 2
Year-wise annual export of fish and fish products in Bangladesh (2000–01 to 2016–17) (FRSS, 2017).

	Frozen Shrimp/prawn		Live Fish		Frozen Fish		Chilled Fish		Dry fish		Salted fish		Crab &Kuchia		Others	
Year	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	value	Qty	Value	Qty	Value	Qty	Value
2000–01	29713	1885.2	0	0	7965	94.89	0	0	137	2.02	838	27.73	154	2.33	0	0
2001–02	30209	1447.8	0	0	9864	137.39	0	0	517	8.32	293	9.53	336	7.07	0	0
2002–03	36864	1719.9	0	0	8846	158.64	0	0	333	7.02	526	19.12	630	14.58	0	0
2003–04	42943	2152.8	0	0	10229	202.24	0	0	472	4.16	377	1.38	116	1.39	0	0
2004–05	46533	2281.6	0	0	15763	256.2	0	0	272	3.71	770	28.97	38	0.86	0	0
2005–06	49317	2698.4	57	0.48	17429	294.14	0	0	150	2.19	591	19.84	1107	12.95	100	1.09
2006–07	53361	2992.3	4	0.07	18376	325.9	0	0	77	1.34	441	12.8	1123	15.48	78	0.86
2007–08	49907	2863.9	10	0.15	23515	495.46	0	0	210	2.67	658	26.97	439	4.88	294	0.41
2008–09	50368	2744.1	0.3	0.006	19294	450.89	0	0	341	11.99	84	3.92	1217	11.98	1308	18.73
2009–10	51599	2885.2	1783	13.22	21464	458.11	0	0	622	25.06	0	0	692	10.41	528	3.85
2010–11	54891	3568.2	0.6	0.045	16743	490	16369	421.05	623	5.57	577	30.86	4485	54.11	2780	33.97
2011–12	48007	3640.2	0.46	0.04	15513	396.18	19026	520.74	996	9.43	411	27.46	5767	95.77	2758	14.14
2012–13	50333	3376.2	0	0	11435	316.36	11831	246.86	1278	36.03	0	0	7428	169.49	2599	13.93
2013–14	47635	4118.8	0	0	11677	337.11	5021	89.07	2634	29.67	261	21.65	7707	164.75	2393	15.89
2014–15	44278	3937.6	0	0	10656	277.63	11629	177.08	2845	36.74	261	25.37	12558	199.38	1297	6.81
2015–16	40726	3598.67	12454	184.28	11133	273.76	7428	163.52	2229	30.12	249	21.03	106	7.09	1013	4.35
2016–17	39705.85	3682.26	0	0	8281.23	236.65	4123.55	94.99	2296.69	30.19	206.9	18.57	12882.5	220.26	808.8	4.65

Quantity in Metric Ton.
Value in Core Taka; 1 US Dollar = 80.59 Taka.

quantity and revenue generated by fish and fishery products have shown a declining trend i.e.75337.93 MT (546.28 Million USD) and 68305.68 MT (BDT 4287.64 Million).

The fisheries sector plays a vital role in the national economy, having a share in GDP of about 3.61%. The GDP contribution of fisheries sub-sector over the last ten years (2007–08 to 2016–17) varied from 3.79% to 3.61% (Table 3).

Inland aquaculture of indigenous and exotic carp species, as well as tilapia, pangas, koi, mola, has expanded massively. Although these indigenous and alien carp species, as well as tilapia, pangas and koi, are getting scarce on open water area, now they are the most widely practised culture system because of their rich source of macronutrients (Belton, Ahmed, & Murshed-e-Jahan, 2014) (see Fig. 6).

3.5. Legal issues

There are different legal issues for the fisheries sector in Bangladesh. Fishing laws and policies in Bangladesh have evolved over many decades. Therefore, the present democratic fish-friendly government has taken the initiatives to formulate the acts and rules (see Table 4).

4. Discussion

The fisheries sector in Bangladesh has undergone rapid changes over the past several decades. After being self-sufficient in fish production for the first time this year, Bangladesh has started to get global recognition as one of the biggest fish producers. Bangladesh has established a credible record of sustained growth in a stable macroeconomic framework. Xuezhen et al. (2010) reported that there is a positive relationship between agriculture and economic growth of a country (Xuezhen et al., 2010). A government could accelerate the rate of economic growth by promoting exports of goods and services (Ahmed et al., 2009). Fisheries resources have emerged as one of the most critical contributors to the export earnings of Bangladesh, and its contribution is the highest in agricultural export.

Among the three most diversified fisheries resources (inland open, culture and marine) of Bangladesh, aquaculture has become an increasingly prominent sector over the past 15 years. In comparison to aquaculture production in 2000–01 (7.87 lakh MT), the production became more than threefold in 2016–17 (23.18 lakh MT). The overall growth performance from inland aquaculture shows a moderately increasing trend through the introduction of new technologies, supportive extension services at farmer's level, improvement of farming in pond aquaculture etc. The Inland capture production has begun to lag in the recent few years. In 2000–01 the inland capture production was 6.8 lakh MT that gradually increased over the year 2008–09, but a slight growth was noticed from the year 2009–10 to 2015–16. At present, inland open, culture and marine sectors are facing different constraints. The major constraints are wetland degradation, overexploitation, use of destructive gears, siltation, closure of natural fish passes, use of pesticides and agrochemicals, discharges of industrial wastes and loss of natural breeding grounds through habitat degradation. Therefore, due to decrease in the production of capture fisheries, the increasing demand for fish protein and the complications for the augmentation in the output from beels, canals, lakes, river and estuaries, aquaculture is moving towards the intensification to boost the country's economy.

The newly settled maritime boundary has enormous potential for marine fisheries in artisanal, industrial and coastal sub-sectors. Although this country has unlimited marine water resources, only 6.3 lakh MT fish production comes from this sector. A significant constraint facing by this sector is overfishing, the encroachment of trawlers by neighboring countries. Government has taken several initiatives for the conservation and protection of marine resources and has declared a marine reserve (covering 698 km^2) and one marine protected area (MPA) (covering 1738 km^2) in the Bay of Bengal (FRSS, 2017). Currently, 32,440 km^2, starting from the coastline to 40 m depth, in the Bay of Bengal, are open to around 67,669 unlicensed fishing boats, of which about 51% are non-motorized boats (Shamsuzzaman et al., 2017a,b). During 2016–17, a total number of 247 industrial trawlers have been engaged in fishing into the EEZ (Fernandes et al., 2015).

National fish Hilsha (*Tenualosa ilisha*) is gaining national and international recognition, and there has been an increasing trend for the

Table 3
GDP contribution over the last ten years (DoF, 2017).

Year	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Contribution (%)	3.79	3.78	3.73	3.73	3.68	3.68	3.69	3.69	3.65	3.61

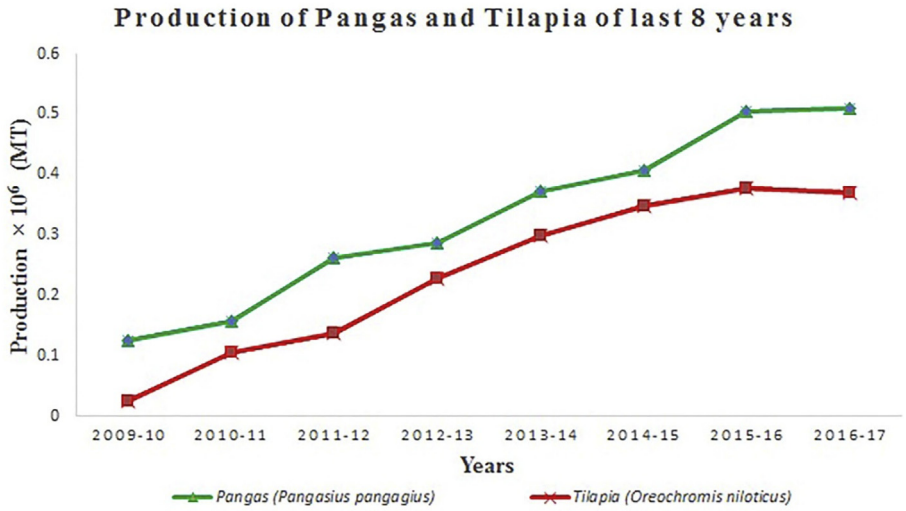

Fig. 6. Total production of Pangas & Tilapia in Bangladesh from 2013 to 14 to 2016–17 (FRSS, 2017).

last 18 years. Scientists have been successful in discovering the genome sequence of the Hilsa fish, which will provide a holistic understanding of the organism's biology and can be used to increase its production and ensure its conservation. It would be noteworthy to mention that, Hilsha production substantially increased due to implementing a unique co-ordinated management program including jatka conservation and development of hilsha fish sanctuaries and preservation of natural breeding grounds etc.

Trade of fish and fish products plays an essential role in boosting fish consumption and achieving global food security. Both domestic and foreign currency correctly exports, and import stimulates the trade sector and promotes economic growth and development of the country (Dutta, 2017) Frozen shrimp and prawn is the most exported commodity in Bangladesh and brings lots of foreign currency for the country (Vohra, 2001). Total shrimp and prawn production, including capture, has increased from 1.6 lakh MT in 2002–03 to 2.46 lakh MT in 2016–17. In 2013–14, the country earned BDT 4,776.92 core by exporting 77.33 thousand MT of fish and fisheries products. This is the highest export earnings in the last ten years, starting from 2017. In 2016–17, the sector earned BDT 4,287.64 crore by exporting almost 68.31 thousand MT of fish and fisheries products. During the last decades, frozen shrimp and fish export market has been constraining day by day and exporters have faced problems for the international meeting standards for the products demanded by most large importers of shrimp, including the United States. By maintaining these standards would provide a significant boon to the viability of seafood exports.

Fisheries in Bangladesh have both prospects and challenges to strengthen the national economy. To address these current challenges, government has undertaken several eco-friendly program including establishment of fish sanctuaries, management measures to protect jatka and brood hilsa, improving biological management of public water bodies, ensuring access of the poor fishermen to fish culture, increasing open water capture fisheries, promoting private sector, improving fish marketing and processing system to meet up the international standards etc. For achieving the SDG target, fisheries laws and policies, especially National Fisheries Policy, 1998 and National

Table 4
Legal arrangements for the Bangladesh fisheries sector (Shamsuzzaman et al., 2017a,b).

Fishing laws and policies	Objectives
Permanent Settlement Regulation, 1793	Under these regulations, large water bodies (*Jalmahals*) belong to direct control and management of the Zamindars which made every individual zamindar and talukdar the permanent and absolute proprietors of the land under their control
The Private Fisheries Protection Act, 1889	This act provides for the protection of private rights for fishing
Pond Development Act, 1939	The purposes of the Act are for irrigation and pisciculture
The Protection and Conservation of Fish Act, 1950	Conservation of fisheries resources as a whole. The text of the Act consists of 9 sections: Short title, extent, and commencement
	Conservation of fisheries resources. The version of the Act consists of 9 parts: Short title, size, and commencement
	Conservation of fisheries resources. The text of the Act consists of 9 sections: Short title, extent, and commencement
The Protection and Conservation Fish Rules, 1985	Regulations on protection and conservation of fish. The text contains 11 articles about various measures of protection and preservation
The Fish and Fish Product (Inspection and quality control) Ordinance, 1983	Quality control, fish and shrimp, mainly targeting export
Marine Fisheries rules & Ordinance, 1983	Marine fisheries conservation & management
National Fisheries Policy, 1998	Conservation, management, exploitation, marketing, quality control and institutional development
Territorial Waters and Maritime Zones Rules, 1977	Conservation, management & development of marine fisheries
Territorial Waters and Maritime Zone Rules, 1977	Preservation of marine fisheries
The Fish Hatchery Act 2010 and Rules, 2011	Mitigate the inbreeding and crossbreeding problems, encourage the hatchery and nursery owners in producing quality fish seeds in hatcheries
Fish Feed and Animal Feed Act, 2010	Maintain the quality of the feed and feed ingredients
National Shrimp Policy, 2014	Flourish the shrimp industry, raise employment opportunity, alleviate poverty, export earnings and meet up the nutritional demand of the people
National Fisheries Strategy, 2006	Emphasizes collaboration, linkages and partnerships, reflects current government concerns for poverty alleviation through more targeted activities

Fisheries Strategy, 2006 can play as an essential key policy. Bangladesh is expected to come out of the least developed country (LDC) and achieve the status of a mid-income country within the next seven years (Islam et al., 2018). In that case, the export of fish and fish products can play a significant role, and Bangladesh is now one of the few LDCs approved to export fish products to the EU (Golub & Verma, 2014). An increase in trade means an increase in foreign exchange, which allows the import of capital goods, which has the effect of increasing the production potential. As production increases, it accelerates the technical progress of production, thus linking a relationship between exports and the growth of output. That's why government and various organization in Bangladesh are striving for a better economy by improving international trade.

One important way by which the fishery sector contributes to national economies is in terms of direct and indirect employment (Béné, 2006). This study will be helpful and can play a significant role for the government in achieving the SDGs target. By paying more attention to fisheries sector, the country's production and export of fish and fishery products can be increased, and the country's economy can be boosted. Nevertheless, these contributions are important for achieving food security and poverty reduction. Also, good fisheries governance, such as through regulated small-scale fisheries, can contribute to sustainable aquatic resource management and provide lessons for water governance too (Westlund & Zelasney, 2019). Fish is a leading export commodity helping Bangladeshi nations to improve their trade balance and believe that it will offer opportunities for developed countries to promote and adopt good trading practices. Value added generated by the fisheries sector substantially increases national wealth (Abila, 2003, p. 31). Fishing licenses and fishery-related taxes are an important source of income for many countries. Bangladesh is not an exceptional. These taxes typically apply on imported fishing inputs, such as fishing gear, engines and fuel, and on fish exports. Secondly, Bangladesh is ideally positioned and suited to become an ecotourism destination. Also, there are abundant opportunities for recreational fishing in Bangladesh which can bring much benefit to the country and can function as an essential tool for sustainable human development; including poverty alleviation, employment generation, and the development of rural areas (Mozumder, Uddin, Schneider, Islam, & Shamsuzzaman, 2018). Hence, Bangladesh government can take steps to explore this field, on the contrary such area will enhance economic contribution of fish and fish trade in Bangladesh.

5. Conclusion

In Bangladesh, fisheries and aquaculture play a pivotal role in alleviating protein deficiency and malnutrition, in generating employment and foreign exchange earnings. The present study gives an overview of fisheries production and its trade over the last decade in Bangladesh. Bangladesh fishery resources have plenty of scope for development and to strengthen the national economy. Although there are diverse fish resources in Bangladesh, fisheries production is handy. The country has limited access to marine fisheries resources in the Bay of Bengal, and other potential marine resources are yet to be exploited on a commercial scale. The concerned government, governmental departments, development partners, researchers and non-government organizations can play an essential role in the wide-ranging advancement of the fisheries sector.

References

Abila, R. O. (2003). *Fish trade and food security: Are they reconcilable in lake victoria.* Kenya Marine and Fisheries.

Ahmed, H. A., & Uddin, M. G. S. (2009). Export, imports, remittance and growth in Bangladesh: An empirical analysis. *Trade and Development Review, 2*(2).

BBS (2017). *Statistical yearbook of Bangladesh.* Bangladesh: Bangladesh bureau of statistics, Government of Bangladesh.

Belton, B., Ahmed, N., & Murshed-e-Jahan, K. (2014). *Aquaculture, employment, poverty, food security and well-being in Bangladesh: A comparative study. Penang, Malaysia: CGIAR Research Program on Aquatic Agricultural Systems* Program Report: AAS-2014-39.

Béné, C. (2006). Small-scale fisheries: Assessing their contribution to rural livelihoods in developing countries. *FAO Fisheries Circular, 1008*, 46.

BFTI (2016). *Bangladesh foreign trade institute, study on sector-based need assessment of business promotion council- fisheries products.* Dhaka: Kawran Bazar.

DoF (2017). *Annual report 2017 Dhaka.* Department of Fisheries, Ministry of Fisheries and Livestock, Government of Bangladesh.

Dutta, C. B., Haider, M. Z., & Das, D. K. (2017). Dynamics of economic growth, investment and trade openness: Evidence from Bangladesh. *South Asian Journal of Macroeconomics and Public Finance, 6*(1), 82–104.

FAO (2018). *The state of world fisheries and aquaculture (opportunities and challenges).* Rome: Food and Agricultural Organization of the United Nations.

Ferdous, S. R., & Hossain, S. D. (2015). Prospect and challenge of Bangladesh frozen food: A way to overcome. *International Interdisciplinary Research Journal, 5*.

Fernandes, J. A., Kay, S., Hossain, M. A., Ahmed, M., Cheung, W. W., Lazar, A. N., et al. (2015). Projecting marine fish production and catch potential in Bangladesh in the 21st century under long-term environmental change and management scenarios. *ICES Journal of Marine Science, 73*(5), 1357–1369.

Finegold, C. (2009). The importance of fisheries and aquaculture to development. *Fisheries, Sustainability and Development,* 353–364.

FRSS (2017). *Fisheries resources survey system (FRSS), fisheries statistical report of Bangladesh, Vol 34*, Bangladesh: Department of Fisheries129.

Ghose, B. (2014). Fisheries and aquaculture in Bangladesh: Challenges and opportunities. *Annals of Aquaculture and Research, 1*(1), 1–5.

Golub, S., & Varma, A. (2014). *Fishing exports and economic development of least developed countries: Bangladesh, Cambodia, Comoros, Sierra Leone and Uganda.* Swarthmore College: UNCTAD.

Hossain, M. A. R. (2014). An overview of fisheries sector of Bangladesh. *Research in Agriculture Livestock and Fisheries, 1*(1), 109–126.

Islam, M. R., & Haque, M. (2018). The trends of export and its consequences to the GDP of Bangladesh. *Journal of Social Sciences and Humanities, 1*(1), 63–67.

Islam, M. M., & Shamsuddoha, M. (2018). Coastal and marine conservation strategy for Bangladesh in the context of achieving blue growth and sustainable development goals (SDGs). *Environmental Science & Policy, 87*, 45–54.

Mohsin, M., Yongtong, M., Hussain, K., Mahmood, A., Zhaoqun, S., Nazir, K., et al. (2015). Contribution of fish production and trade to the economy of Pakistan. *International Journal of Marine Science, 5*.

Mozumder, M., Uddin, M., Schneider, P., Islam, M., & Shamsuzzaman, M. (2018). Fisheries-based ecotourism in Bangladesh: Potentials and challenges. *Resources, 7*(4), 61.

Rahman, M. (2008). *EU ban on shrimp imports from Bangladesh: A case study on market access problems faced by the LDCs*.

Roy, N. C., & Habib, A. B. M. Z. (2013). *Hilsafishery development: Present situation, problems and recommendations. National fish week 2013 compendium (in Bengali)*. Bangladesh: Department of Fisheries, Ministry of Fisheries and Livestock.

Shamsuzzaman, M. M., Islam, M. M., Tania, N. J., Al-Mamun, M. A., Barman, P. P., & Xu, X. (2017). Fisheries resources of Bangladesh: Present status and future direction. *Aquaculture and Fisheries, 2*(4), 145–156.

Shamsuzzaman, M. M., Xiangmin, X., Ming, Y., & Tania, N. J. (2017). Towards sustainable development of coastal fisheries resources in Bangladesh: An analysis of the legal and institutional framework. *Turkish Journal of Fisheries and Aquatic Sciences, 17*(4).

Toufique, K. A. (2015). Some thoughts on hilsa exports and management in Bangladesh. *Bangladesh Development Studies, 38*(2), 115–127.

Vohra, R. (2001). Export and economic growth: Further time series evidence from less-developed countries. *International Advances in Economic Research, 7*(3), 345–350.

Westlund, L., & Zelasney, J. (2019). Securing sustainable small-scale fisheries: Sharing good practices from around the world. *FAO Fisheries and Aquaculture Technical Paper,* (644), I–182.

Xuezhen, W., Shilei, W., & Feng, G. (2010). Therelationship between economic growth and agricultural growth: The Case of China. *International conference on E-business and E-government (ICEE)*.